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FOREST SERVICE

BRANCH OF RESEARCH

MONTHLY REPORT

OF

FOREST EXPERIMENT STATIONS

FOREST ECONOMICS

FOREST PRODUCTS

RANGE RESEARCH

APR 1931



BRANCH OF RESEARCH

April, 1931

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FOREST EXPERIMENT STATIONS

APPALACHIAN FOREST EXPERIMENT STATION

General

The senior classes of the University of Michigan and North Carolina State College forest schools visited the Station under the leadership of Professors L. J. Young and Ralph W. Hayes, respectively. Tents were set up for them on the Bent Creek Experimental Forest, and the Station's work there was explained on the ground by I. H. Sims. Trips were made through the Biltmore Estate to the experimental plantings in the Black Mountains, the disengagement plots near Lookingglass rock and elsewhere. The station also had numerous other visitors, among them Dr. and Mrs. W. E. Hiley, of Oxford, England, and F. X. Schumacher, of the Washington Office, G. L. Turner, and A. Bennett of the Dartington Estate in Devonshire, England.

Schumacher's visit was taken up with conferences on the statistical handling of Sims' and Nelson's fire damage data and with plans of Barrett and MacKinney for future work on growth studies.

Buell was detailed to Washington early in the month to assist in the preparation of the report on sample plot procedure.

Most of Frothingham's time during April was spent on the preparation of the annual report and project estimates, and on the "extensive revision" of statistics for four States in the Station's territory.

Bent Creek Experimental Forest

Work on the four mile "Hardtimes" road traversing the forest was pushed rapidly during the month. Final grading remains to be done and drainage culverts are to be put in. It is expected that this road will be completed during May.

The new metallic telephone line from Asheville to Bent Creek was completed, the final connections to the telephone company's line being all that remains to be done to reestablish connections with the laboratory.

Thinnings in Southern Pines

During 1925 five 1/4 acre plots were established in a second growth stand of longleaf pine at Pregnall, S. C. Four of these plots were thinned with different degrees of severity, from 4 to 30 per cent of the stand volume being removed, and the fifth was left as a check. These

plots were reexamined in 1930 and the results were compiled during the past month. To date the most heavily thinned plot has been the only one to show marked response to the treatment. The average annual cubic volume growth per tree was 0.72 cubic feet on the check plot and 0.84, 0.82, 0.82 and 0.92 cubic feet on the thinned plots in the order of increasing severity of thinning.

Management - Loblolly Pine

Preliminary computations for the Windsor, N. C., selective cutting plots were completed during the month. These sample plots, 4 in number, were marked and cut over selectively. Cuttings of different degrees of severity were made on the several plots. Before the cutting the average stand per acre on the plots was 20,600 board feet (lumber tally, dry). The average number of trees was 183 per acre. After cutting, the stands on the plots contained 3900, 5900, 9800, and 6100 board feet respectively.

A relatively large amount of damage was done to the reserved pines during logging. One pine per acre of the residual stand was cut in making logging roads, skidding trails, and in preparation for falling other pines, 6.4 trees per acre were damaged beyond recovery, and 12 per acre received minor injuries from which they are expected to recover.

These plots will furnish valuable information on the healing of logging scars and rate of recovery of injured trees, in addition to data on the establishment and development of reproduction and the growth of the stand left after selective cutting of different severities.

Forest Management in North Georgia

With Daley, Genth, and Bonnell Stone, Barrett spent the last two weeks of April in the Blue Ridge section of North Georgia. Fifty-three half acre strips were tallied in various forest-condition classes and increment borings were made for growth computations. Two permanent lines of quadrats were established to study the seeding in of Virginia pine on cut over hardwood lands. Note was made of two forest problems of outstanding interest on which it is believed that work should be done in the region in the near future. These are (1) growth and yield of Virginia pine, (2) release of white pine understory by cutting, girdling, or poisoning all or parts of the hardwood overstory.

The first of these problems is important because of the rapidity with which Virginia pine occupies abandoned fields and pastures. It is generally conceded in the mountain section of north Georgia that the area occupied by this species is increasing. Three sample plots measured in well stocked stands from 26 to 45 years of age indicate that the species is capable of producing a yearly average of from 1.0 to 1.5 cords of pulpwood an acre. According to Ranger Arthur Woody of the

Cherokee National Forest, as much as 75 cords of Virginia pine per acre have been cut on timber sale areas in his district. Under normal economic conditions the species finds a fair market as pulpwood.

The second problem arises as the result of several years of protection from fire on both private and national forest lands. There are already extensive areas on which a fair understory of white pine is established. The problem of converting the present almost pure hardwood forest into a mixed pine-hardwood forest is one deserving immediate attention.

Test of Species

Several new plantations of modest size were established by Sims during the month and failures in the Bent Creek arboretum and the Glenn Bald plantation of red pine were filled. New plantations included an acre of Japanese red pine in the Glenn Bald Gap and a planting of holly in the Arboretum at Bent Creek. Tenth acre plantings of white spruce, Sitka spruce, and Engelmann spruce were also made on the two sites on Clingman's Peak near Mount Mitchell. The severe weather of the summer of 1930 caused heavy mortality in a plantation of red pine established last spring on an old field on Glenn Bald. The failures were replaced and the plantation extended somewhat so that it now covers a little more than an acre. The 1930 drought also accounted for rather heavy losses in the arboretum which were replaced this spring.

Examination of the Bent Creek plantings shows considerable differences in the growth of the various exotic species, although the plantings are still too young to warrant any broad generalities as to the adaptability of the species for general use in the region. Southern white cedar and Scotch pine are making the best growth and are followed by red pine, Japanese red pine, northern white cedar, cottonwood and Asiatic chestnuts. The growth of the other species tested is only fair to poor. Loblolly pine which was planted last year in the arboretum survived the winter well and gives promise of making good growth this year.

Forest Pathology

Seven thousand Asiatic chestnut seedlings were planted by Nelson on and near the Bent Creek Experimental Forest under various conditions and on several sites. One planting of 700 trees was made in an open ridge top pasture. Adjacent to this planting 500 trees were interplanted in an open stand of shortleaf pine. An underplanting of 1200 trees was made under hardwood poles in an upper cove. Matched with this is half an acre, 500 trees, in a newly cleared area on an upper slope. One thousand of the seedlings were made up of small series representing all the environmental types of the orient. These were planted in two

plots having a difference of elevation of 800 feet. The rest were set out in an old field on lower slopes.

During the past two years approximately 8,700 Asiatic chestnut seedlings have been planted on and near the Bent Creek forest.

Biology

A badly infected finger seriously interfered with Burleigh's collecting during the month but it is rapidly healing and the work should progress as usual in the near future. A close check on the spring migration has been kept, however, and a number of interesting observations made. Erratic weather accounted for some unusual observations, such as seagulls in mountain fields. First observations on some species were as much as two weeks later this year than in 1930.

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CALIFORNIA FOREST EXPERIMENT STATION

General

Kotok spent considerable of the month on the manuscript of a new fire bulletin with Regional Forester Show. The month was a busy one for a number of staff members on the revision of the Capper Report data for California, which, with unemployment appropriation building and improvement activities, cut into project time considerably.

Management

With the office progress reports pretty well out of the way, Hasel and Clements remeasured thinning plots in Sierra mixed conifer second growth and finish^{ed} the reexamination of the older Stanislaus Mc plots. This work was considerably interrupted, however, by the necessity of fighting two fires at elevations of 6,000 - where snow ought to be yet on the ground.

Redwood Studies

Person, assisted by Gibbs, spent the month on a study of the results of planting in the redwood region. Most of the field work has been on the plantings of the Pacific Lumber Company, the Union Lumber Company, and the Casper Lumber Company in Humboldt and Mendocino counties. Through the kindness of officers of the above companies complete maps of the planted areas studied were obtained so that it was possible to select strips through the

different plantings which would be more or less typical of the different conditions encountered. One-tenth acre quadrats mechanically selected along the strips were used as the basis for the study. A fairly complete physical survey is made of each quadrat and individual tree records, showing condition, height, injury, and shade, are made for all reproduction on these quadrats, natural as well as planted.

As none of the records have been analyzed it is possible, at this time, to give only a few general impressions. It is evident that under reasonably favorable conditions, particularly on northerly slopes where good stock is planted under the supervision of reliable foremen, - a good survival is usually obtained. An exception would be in the case of areas heavily grazed too soon after planting or where rodents are unusually a handout. On southerly slopes, especially if steep, good survival is the exception rather than the rule. Redwood, after once becoming established, is very tolerant of shade, - many thirty trees, were found growing in practically complete shade, - a resistant to fire in that a very high per cent of the trees on burned over areas will send up fresh sprouts even if only planted for a year or two. The growth of planted redwood, at least for the first 5 or 6 years, is slower than was expected. Surviving trees planted from 1923 to 1925, though ranging in height from a few inches to seven feet, probably average less than three feet. Sprouts of the same age would average between 15 and 20 feet in height.

Natural seedlings, both redwood and Douglas fir, are more common than was expected and on some areas would be an important factor in restocking. This is particularly true near the tops of ridges and on areas where trees were removed some years ago for ties and split stock.

While in Mendocino County Person met Mr. Swales, Assistant Manager of the Union Lumber Company, Mr. Stickney, Manager, and Mr. McGuire, Woods Superintendent, of the Casper Lumber Company, and discussed the work that is being planned for the redwood region by the Station. Mr. McGuire has shown an interest in protecting the trees left on an area after "chopping" and on one area he has been able to save a high percentage of the "leave" trees by "spot" burning the slash in February when the fires would not run.

Cover Types

April marks a milestone in the cover type project in that the field work for one important region, namely, southern California, has been entirely completed. This region embraces seven counties. Santa Barbara, Ventura, Los Angeles, Orange, Riverside, and San Diego containing four national forests, the Angeles, Santa Barbara, San Bernardino, and Cleveland. With the completion of this region, the type crews dwindled from ten to four men as four Junior Foresters and two State Rangers loaned to the type project for the winter, respectively by the Regional Forester and the State Forester, had to return to their summer stations. One of the remaining crews moved to the Tehachapi Mts. and the other to the inner south coast ranges in San Luis Obispo County.

Fire Research

Visibility (Proposed Lookout System).

The visibility study for the Sacramento Canyon Unit of the Shasta Experimental Fire Forest was completed to the extent that a final selection of lookouts could be made. Conferences were held, with the illustrative material, in regard to the proposed lookout system with members of the Regional office and the Shasta National Forest. As a result work has been authorized on four new lookouts.

The proposed system consists of eight lookouts in the unit which is the heaviest fire district on any Forest in Region 5 (an average of 100 fires per year). The total area of the unit is approximately 400,000 acres with 100,000 acres of fire business zones. These eight lookouts will give 84 per cent coverage, direct visibility, of the fire business zones. Any lookouts beyond this number would add but one per cent coverage which would of course not balance the service obtained.

The following gives a comparison of the coverage of the former lookout system and the proposed:

<u>Per cent of</u>		<u>Former</u>	<u>Proposed</u>
Unit seen		42 %	74 %
Fire occurrence areas seen		32 %	84 %
Fires in seen area;			
A & B's	865	A & B fires 20%	91%
C's	<u>138</u>	C " 3%	86%
	1003	All fires 20%	90%

Radius of Vision

A study was made from visibility and fire occurrence zone maps for two representative forests of the areas visible, area of fire occurrences zones, and areas of fire occurrence zones which were directly visible. These areas were classified according to distance from the lookout, i.e., 0-5 mile radius, the ring between 5-10 miles, 10-15 miles, 15-20 miles, and 20-30 miles radii for seven lookouts. Some of the results secured are given in the tables below.

<u>Zones</u>	<u>0-5 mi.</u>	<u>5-10 mi.</u>	<u>10-15 mi.</u>	<u>15-20 mi.</u>	<u>20-30 mi.</u>
Acres in each zone	50,278	150,910	251,341	351,872	1,005,312
Acres seen by zones	16,512	36,700	36,072	26,000	31,000
Acres of fire occurrence zones	27,136	75,520	102,400	122,880	266,008
Acres-fire occurrence zones which are seen	11,187	27,213	22,272	14,541	13,363

The above tabulation indicates taking the average individual lookouts as the base that

1. Area actually seen does not increase in proportion to the total acreage. In fact it remains relatively constant after the 5-mile mark is passed.

2. The zone 0-5 miles radius has the least visibility of any of the zones.

3. It is logical that as distance from the lookout increases and more acreage is thrown into the zones for fire occurrence zones to become greater as shown.

4. Fire occurrence zones covered by visibility from the average lookout is greatest in the 5-10 mile zone and decreases as greater distances are considered.

5. Fire occurrence zone 0-5 miles covered by visibility is lower than in the remaining zones.

Numerous other comparisons were made by individual lookouts. They show that there is individual variation depending on the contour and elevation of lookout point and the surrounding topography. However, this variation is not great and allows average figures to indicate tendencies.

The fire research crew started 1931 field work on the Shasta Experimental Forest during the latter part of the month. Mapping of the possible lookout points in the eastern and remaining units of the Shasta Experimental Fire Forest will comprise the work during the next month.

Forms

Several forms were devised or revised to furnish data for analysis of detection, use of water on fires, action of suppression crews, degree of haze or smoke, and dispatcher action. The use of water forms are for the purpose of securing time, amount, method and results of application of water by tank trucks, power pumps, and back pumps.

Influences

Erosion Control

An interesting development of the month has been the effort begun by the Regional Office to minimize erosion on a proposed new road in the San Bernardino National Forest. As an outcome of a conference, of Assistant Chief Engineer Lautz and Regional Engineer Kramer with Kotok and Kraebel of the Station, an agreement has been reached by the Forest Service and the Bureau of Public Roads to devote \$10,000 of the \$310,000 available for the Mill Creek Project, to erosion control measures along lines to be

suggested by the Experiment Station. Since the invitation for bids is being delayed by this action, a memorandum was prepared immediately on request of the Regional Engineer, suggesting control and revegetation measures which might require inclusion in the road specifications. The matter has been submitted for Departmental approval, and when this is assured the Experiment Station will proceed with plans and necessary advance preparation at the nursery for this work. The Station will cooperate actively on the job in developing control measures as the work progresses, and will supervise planting on the finished road.

This seems an excellent opportunity to make progress in line with the Forester's statement of March 16 on road construction (L, Uses, Road-side Strips). This particular road project is too far advanced to permit of any major alteration either in alignment or design, and limitation of funds prohibits the extensive use of retaining walls to reduce the surface area of overcast slopes. Consequently conservational activities must be confined to what might be called finish and reconstructive features. Suggestions from other stations for methods within this limitation which might be tried out on this project will be gladly received. The contract will probably not be let until June 15 or 30.

Special

Natural Areas

Two men of the Station staff, Wieslander and Kraebel, are members of the California regional committee on natural areas and experimental forests. This committee at its first meeting in April devised a set of guiding principles for the selection of natural forest and range areas in California, and recommended priorities in selection for the important timber types in the region. It was brought out that field work in connection with the selection of these areas is a task of major proportions. Up to the present this work has been done by Dunston of the Regional Office and Wieslander, who are able to give only three or four weeks out of each field season to the task. Considerable assistance from the forest supervisors must be obtained if the regional program of natural areas and forests is to be realized within a reasonable time. The committee will push the early selection of areas in virgin timber types which are threatened with extinction by exploitation.

Reforestation

Devil Canyon Nursery

Seedbed work was completed by the setting of 17 beds during April. A beneficent six-day storm late in the month brought a total of 6.75 inches of rain and made possible completion of experimental plantings. Many small lots of potted trees which have been held for over two months

awaiting favorable weather were set out in windbreaks and roadside plantings. A test planting of *Mesembryanthemum* cuttings was made in a firebreak near the nursery.

Several hundred cuttings of three species of *Euphorbia* for ultimate firebreak planting were obtained from the Tropical Plant Introduction Garden of the B. P. I. at Torrey Pines. These were divided into three lots and planted at Devil Canyon Nursery, San Bernardino City Nursery, and Berkeley, respectively.

The weather at Devil Canyon during the first 21 days of April approached midsummer heat and drought. The maximum temperatures ranged between 80° and 90°; the lowest minimum 40°, the highest minimum 62°, during the three weeks period.

Feather River Nursery

Both transplanting and seedbed work were completed during the month. These operations were interrupted by a snowfall of 6 inches which occurred immediately after completion of the transplanting. Nursery experiments initiated include pre-treatment of sugar pine seed by cold moist storage to stimulate germination, and the fertilization and soil treatment of transplant beds.

Products

California Economic Research Council

At a meeting of the Natural Resources Committee a jubilation was held over the passage by the Legislature of the State budget, representing success of the movement fathered by the Committee to increase the State appropriation for 50-50 cooperation with the U. S. Geological Survey in the topographic surveying of the State from \$40,000 for the biennium to \$100,000. Agreement was also reached on recommendations, at the request of State Engineer Hyatt, for an advisory committee in programming priorities in the increased survey work, so as to make them represent technical needs rather than political pressure. This committee will meet with the State Engineer and the U. S. Geological Survey's regional representative on May 8. Hill will participate and endeavor to get the Station's type map needs provided for. The rest of Hill's time during the month has been chiefly spent on the drain portion of the Capper report revision.

Woods and Mill Study

In the February number of the Branch Monthly Report, Region 1 compared the average western yellow pine trees from three studies made

there with the average tree in the Region 6 Shevlin-Hixon Study. Presumably these were the average trees cut and not the averages of all trees 12" and over in the original stand. Although the average diameters BH were the same in both regions, and the volumes were very close, the grades produced were quite different. A further comparison of these average representatives of the predominating western pine as it grows in the Inland Empire and in Oregon with the average tree of the same species as cut on the Stanislaus study plots in Region 5 is given below. The average 24" tree from the latter study is also entered so that trees of the same DBH from the three localities may be compared.

Western Yellow Pine - Average trees cut in
Woods-Mill studies - Regions 1, 5, 6,

Region & Locality			:Avg. :Diam.	:Vol., :Scale	Gross:DBH Range : (cut)
R-1, Western Montana	3 studies	:	24"	690	?
R-6, S. E. Oregon	1 study	:	24"	370	10 - 41"
R-5, Central Sierra, Site	1 "	:	44"	4080	19 - 74"
R-5, " " "	1 "	:	(24")	(695)	19 - 74"

Percentage of Grades Produced

Selects and Shop										
: Region: DBH	: B & : Btr.	: : C	: : D	: 3 : Clr.	: 1 : Shop	: 2 : Shop	: 3 : Shop	: Inch : Shop	: : Mldg.	:
R-1 : 24"	: 6.30	: 6.00	: 11.60	: -	: 1.20	: 2.70	: 2.20	: 2.20	: -	:
R-6 : 24"	: .67	: 3.06	: 5.38	: -	: 1.26	: 8.51	: 3.25	: 4.05	: -	:
R-5 : 44"	: 8.5	: 6.2	: 4.5	: 8.4	: 12.5	: 13.0	: 7.8	: 1.8	: 0.5	:
R-5 : 24"	: 1.0	: 1.8	: 4.2	: 1.6	: -	: 5.5	: 3.4	: 4.9	: 0.6	:

Common %										
: Region: DBH	: : 1	: : 2	: : 3	: : 4	: : 5	: :	: :	: :	: :	: :
R-1 : 24"	: 1.00	: 27.80	: 33.10	: 5.50	: .40	:	:	:	:	:
R-6 : 24"	: 2.53	: 33.12	: 30.14	: 7.12	: .91	:	:	:	:	:
R-5 : 44"	: 0.7	: 7.5	: 19.8	: 5.2	: 0.6	:	:	:	:	:
R-5 : 24"	: 1.0	: 31.8	: 38.3	: 5.8	: 0.1	:	:	:	:	:

Recapitulation by grade groups
of High, Medium, and Low Values

: Region: DBH	: : C & D Sel	: : 1 Sh.	: : 1 & 2	: : 3 Sh	: : 4 & 5	: :	: :	: :	: :	: :
	: Btr.	: 3 Clr.	: & 2 Sh.	: Com.	: 3 Com.	: Com.	:	:	:	:
R-1 : 24"	: 12.30	: 11.60	: 6.10	: 28.80	: 35.30	: 5.90	:	:	:	:
R-6 : 24"	: 3.73	: 5.38	: 13.82	: 35.65	: 33.39	: 8.03	:	:	:	:
R-5 : 44"	: 14.7	: 12.9	: 30.8	: 8.2	: 27.6	: 5.8	:	:	:	:
R-5 : 24"	: 2.8	: 5.8	: 11.0	: 32.8	: 41.7	: 5.9	:	:	:	:

^oIncluding Inch Shop and Moulding (not Edging.)

Note that the average western yellow pine cut from the site 1 plots (diameter determined by the basal area method) in the R-5 study, was 20 inches larger than those in the other studies, and three inches larger than the biggest tree cut on the Oregon area. The diameter of the average sugar pine in the California study was 46.7 inches. Aside from the average grade relationships, which tell a very interesting story regarding the variations in western yellow pine development in various parts of its extensive range, the relative size data reveal one reason why the R-5 study is requiring so much more computing labor than other projects of the same kind. Curves, tables, etc., are directly proportional in length to the ranges of log diameters and tree diameters studied. There is also an increasing range of the different thicknesses of lumber cut as diameter increases, which means more computations per diameter.

Last month the routine work leading up to the type of results to be published for the information of the lumber industry was disrupted by a call from Forest Management for special data suitable for the use of the Regional Logging Engineer in appraising timber sales on an economic basis. This was brought about by the Forester's recent decision to depart, at least temporarily, from the old arbitrary utilization standards which were founded on the theory that a board foot sawed was a board foot grown and therefore should not be discarded even though the cost of conversion was considerably greater than the value of the material saved. Part of the special summaries have been forwarded to the Regional Office, but considerable remains to be done, especially in respect to depreciation and remanufacture.

Copper Report

Past, present and future of the California lumber industry, shingle industry, pulp and paper industry and other forest products businesses were assigned for analysis to the Forest Products office. California ranked fifth in the list of lumber producing states during 1929 with a cut of 2,063 MM feet. Based on census reports so far received, it appears that the 1930 cut was only about 75% of the 1929 volume. 1931 production is apt to be lower still, for a few of the larger mills are not going to operate. It's hard to predict the future from such a misbehaving curve. Bruce and Reineke should write a bulletin on "Solving problems in curvilinear multiple imagination". California production and consumption of hewed ties, poles, piling, posts, fuel wood, and the special products of the redwood split stuff industry not paralleled elsewhere, such as grape stakes and split shakes, are difficult items to get at with any approximation of accuracy.

Consulting Entomologist

A reconnaissance of areas along the western front of the Sequoia and Sierra National Forests was made during the week of March 30 - April 4 by Miller and Salman; they were accompanied on this trip by T. D. Woodbury

of the Forest Service and Willis Wagener of the Office of Forest Pathology. Forest officers had reported a heavy loss of yellow pine during the past winter within this area, which includes a narrow strip just above the brush belt, approximately 100 miles in length. It was found that the western pine beetle was rapidly increasing throughout this area. There has been a deficiency of precipitation in this region for the two preceding seasons, followed by very dry conditions during the winter of 1930-31. This may have been a contributing factor to the recent bark beetle epidemic.

A discussion of the bark beetle control problem was the subject of two seminars held by graduate students of the California Forestry School on March 24 and 31. The first discussion was led by J. M. Miller and the second by H. L. Person of the California Forest Experiment Station.

A review of the literature and preliminary experiments dealing with the nutritional requirements of the western pine beetle has recently been worked up by R. N. Jeffrey. This review will be used as a basis for further experiments to be carried out during the 1931 field season.

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CENTRAL STATES FOREST EXPERIMENT STATION

Plantation Study (Ep-1)

The compilation of black walnut plots was continued by Kellogg with the help of the computing section in Washington. The yield table study was about half finished before Kellogg returned to Columbus to take measurements on sample plots in plantations near Columbus, and to prepare for the coming field season.

It was found that the walnut plots, although plantation grown, were susceptible to analysis just the same as natural stands of other species. The age, 50 years, was chosen as the age of site classification, because 75 was the oldest age at which suitable plots were secured. The site indices of plots were found to extend from 35-84 feet at age 50. This spread allowed the recognition of five sites, 40 to 80 feet inclusive.

Plots were eliminated on a basis of several tests. Excessive deviation in total basal area, total number of trees, and ratio of total number of trees to average d.b.h., uniformity in tree distribution on the plot, and occurrence of recent thinning, were all used as a basis to judge the retention or rejection of plots. In spite of these many tests, only 9 were eliminated out of the original 204 plots.

It was further found that individual black walnut plots did not deviate from final tabular values much more widely than in studies of natural stands.

Studies to determine the influence of initial space per tree and of spacing ratio (i.e. ratio of length of spacing to width, as 4 x 4 vs. 4 x 8) have been unsatisfactory, and will be continued. These studies indicated that the tables apply to stands of about 7 x 7 original spacing. Closer spacing will call for slight raises in tabular values, and wider spacing will require reduction in values.

Woodland Grazing Study (Pa-1)

Day has found in his study of grazing in relation to the farm woods, that the practice of pasturing fenced woodland areas threatens to destroy the farm woods. Such pasturage is of doubtful value to the owners because of the small amount of forage in a fenced woods. In order to get definite data on this livestock management phase of his study, an oak-hickory woods near Valparaiso, Indiana is being grazed in three degrees of severity under supervision of the manager of the Pinney-Purdue farm. Nine steers were secured in the Chicago market and are distributed in the ratio of one head to 2, 4 and 6 acres. The stock was put in May 1.

Eighteen square rod quadrats were located and the reproduction over six inches high were tagged, measured, and charted. Half of these plots will be grazed and the others have been fenced against the stock. Periodic remeasurements will be made on these areas to determine the effect of the various intensities of grazing on the young trees. Although the overhead stand is predominately black oak, the reproduction was almost entirely black cherry, blue beech, and hop hornbeam with a very few shagbark hickory and only one black oak seedling on eighteen plots. This distinct lack of oak seedlings is rather difficult to explain. The area has not been heavily grazed for several years and a heavy growth of blackberries has come in over much of the area which has been favorable to the retention of most of the litter so the answer is probably not winter killing. The most logical solution is the presence of a species of nut weevil. There was a fair crop of both black and white oak acorns last fall, and DenUyl found a large per cent to be infested.

It is too early yet to judge the germination from this late crop but from all indications it will not be any better than the preceding. An effort will be made this fall to determine just what is preventing the establishment of these oaks.

The cost of this fencing may be of interest to some other Stations. Under the terms of our agreement this was divided as closely as possible between the University Farm, the Forestry Department of the Purdue Agricultural Experiment Station and ourselves. The materials were furnished largely by the Farm and the Agricultural Experiment Station while the labor charges were borne by this Station.

Litter Study (M-1)

Auten continued his calcium and magnesium studies during the month and extended the base exchange determinations to virgin forest areas in Indiana and Illinois. One plot is worthy of comment, namely, the Pine State Park in Ogle County, Illinois. This is an area of pure white pine which, according to old settlers, has been in pine from earliest recorded time. The interesting observation regarding this particular plot is the calcium and magnesium content of the pine litter. Coniferous timber is usually found in highly silicious soil and has a litter low in the alkaline-earth bases, but this pine grows on a silt loam soil weathered from dolomitic limestone and its litter as far as calcium and magnesium content are concerned is about the same as hardwood litter. There is no evidence of podsolization.

Auten spent a few days in Ross County and southern Ohio, engaged in a study of soil moisture content following the drouth. About two hundred soil samples were taken but as yet the quantitative determinations have not been completed. Observations, however, seem to indicate a greater moisture content in the woods soil than in the adjacent field soil where runoff is relatively unimpeded. The particular area studied is very typical of the so-called abandoned land area. The slopes are steep and subject to rather severe erosion. According to old settlers, the land was quite fertile in the early days, but after a period of twenty-five to forty years, lost its fertility to the extent that now it does not pay the cost of fertilizers and labor. Much of this land has an excellent stand of second growth oak and will no doubt, with the proper protection come back to timber and be productive. A white oak stump was observed in one of the abandoned fields and showed less than two rings to the last radial inch. Obviously such land as this is better fitted for the growing of oak timber than to the growing of farm crops.

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NORTHEASTERN FOREST EXPERIMENT STATION

On April 15 a conference of men engaged or directly interested in planting research was held in Boston at the call of a committee of the Northeastern Forest Research Council. Twenty-three men representing nearly all the forest schools and state departments of the region attended the meeting and spent the entire day formulating plans for the extensive survey of plantations to be initiated by the experiment station this summer, and discussing ways in which a unified program of planting research could be developed in the region. Much interest was shown in a suggestion that experimental plantings throughout the region be undertaken

by the experiment station in cooperation with other agencies using stock of selected seed specially grown for the purpose at one of the established nurseries.

On April 23 Behre and Tillotson participated in a forestry inspection trip in Rhode Island arranged by the state forestry office as a basis for discussion of the state's forestry problems from an economic viewpoint, and how the state college and agricultural experiment station might contribute toward the development of the forest resources. The party included H. R. Lewis, Commissioner of Agriculture; R. G. Bressler, President, Rhode Island State College; B. E. Gilbert, Director, Rhode Island Agricultural Experiment Station; and G. E. Adams, Director, Rhode Island Extension Service, and four other members of the college and experiment station staff.

Behre spoke on "The Forestry Situation in the Northeast" at the annual banquet of the Dark Entry Forest, Inc., in New York on April 30. This organization is a group of people owning a tract of land in northwestern Connecticut with the objective of developing it for recreation and forest utilization.

Behre spent the major part of the month on the Extensive Revision of the Capper Report for Massachusetts. With considerable survey material available in the form of county strip cruises giving distribution of the area by types and size classes and state forest surveys giving representative stand tallies in the various types there was more manipulation of figures to be done than anticipated and the job proved quite onerous.

Stickel continued his experiments with calcium chloride as a possible forest fire retardant. This project is being conducted with the assistance and cooperation of the Massachusetts State Forest Department, the Solvay Sales Corporation, and the Paper Makers Chemical Corporation. The experiments were confined largely to grassland areas. Four plots were established along a railroad right of way under potential burning conditions. These plots were treated with two pounds of calcium chloride per square yard. Plots were also established under actual burning conditions. Results to date would indicate that the dry calcium chloride scattered on a fire line must have time to deliquesce in order to be effective. The period required for deliquescence depends upon atmospheric conditions, but the chemical must be allowed to remain at least one night. No trace of the compound remained on the surface after heavy rains. A four-foot fire line, covered with two pounds of dry calcium chloride per square yard which had thoroughly deliquesced, effectively stopped a grass fire at most points. The fire was set in the early afternoon at the height of the fire season. A minimum amount of work was necessary to bring the fire under control where it did enter the treated fire line.

Stickel completed and sent to the reviewers his manuscript on "The Measurement and Interpretation of Forest Fire-Weather in the Western Adirondack Mountains of New York."

Spaulding made brief visits to Boston and Marthas Vineyard collecting data on tree diseases. He also spent a few days in Washington for a conference on the season's work.

MacAloney spent two days at Marthas Vineyard making plans and arrangements for his work on the direct control of the white pine weevil. This project will be conducted in cooperation with the state and local private owners. "The Improvement of Severely Weeviled White Pine Plantations" by MacAloney and A. C. Cline has been reviewed and will appear shortly as a bulletin.

While at Marthas Vineyard, Miller obtained pictures of what is believed to be the only living heath hen. He also spent a short time at the Moose Hill Bird Sanctuary at Sharon, Massachusetts.

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NORTHERN ROCKY MOUNTAIN FOREST EXPERIMENT STATION

Early in April the last of the 12,062 coded fire reports were photostated, copies being made of about 170 complete reports on each photostat, as insurance against loss. The original tabulation sheets were then forwarded to Washington. Gisborne of the Station and Hornby of the Regional Office left for Washington on the 29th of the month to do this work. Preliminary results are expected by the end of May.

During the month a very helpful conference was held by Major Kelley, Stockdale, Hornby, and Gisborne to discuss Hornby's preliminary analysis of the information needed by the transportation and organization study. Hornby has reduced the fundamentals largely to mathematical equations for which values of the various terms are now desired. The derivation of these values will result from the analysis of the fire records, except in those cases in which there are insufficient fire reports and also in the cases in which the original reports are not sufficiently accurate. With over 12,000 reports from 13 Forests, however, it should be possible to determine most of these values very dependably.

A map and list of 124 lookout stations selected for use hereafter in the lightning storm study also were completed in April and copies distributed to the Forests. Field men have been unanimous in expressing their approval of this reduction in the number of lookouts to be used in this study, and it is fully expected that the future storm reports will be much more accurate than those obtained in the past.

Exceptionally dry and windy weather (humidity 17%, wind up to 27 m.p.h.) during the third week in April resulted in a special advisory

forecast from the Spokane Office of the Weather Bureau, which was correct in every particular according to our weather measurements in Missoula. Very few, if any, forest fires were reported during this three-day period, but several have occurred since then as a result of the cumulative drying of the fuels. Instructions were therefore prepared asking all of our field weather stations to commence measurements immediately. The Priest River meteorological equipment was inspected by Gisborne and prepared for full operation.

At the request of Major Bowie, of the San Francisco Office of the Weather Bureau, Gisborne prepared a short description of the extraordinary diurnal fluctuations of barometric pressure recorded every summer at Priest River. A nightly rise and a daily fall of from a half to three-fourths of an inch in pressure is common there during fair weather. During stormy weather the barometric curve becomes more nearly normal in its smoothness.

Haig spent about half of April upon the transect phase of the methods of cutting study chiefly analyzing the reproduction records upon individual timber sales. A considerable amount of work still remains to be done on this project before the final report can be prepared. Haig believes that here is one job at least on which punch card analysis has proved less satisfactory and more time consuming than hand analysis would have been. The chief difficulties with the punch card system have been the impossibility of obtaining subtotals at frequent enough intervals without an excessive number of runs, thereby necessitating a great deal of hand totaling; the difficulties of eliminating misleading values due to extreme conditions; the impossibility of seeing beforehand all of the sorts desired, the necessity for many of these not appearing until other sorts are analyzed, and the resultant necessity of either making these sorts by hand or undergoing inconvenience and delay while they are requested by letter. Many of these objections could be eliminated, of course, by personal supervision of the sorting and tabulating work but, nevertheless, they are important factors in any complicated analysis which must be supervised at a distance through written instructions.

Temporary Assistant Fisher spent part of the month on computation work at Missoula and part at Priest River on the annual job of recovering and sorting stored seed. There are two active installations on the program in which seed of a half dozen species in the white pine type were stored naturally in the duff in sets to be taken up annually over a period of eight years. The oldest of these experiments is now four years old and germination of white pine seed is still being secured.

Haig prepared a review of Professor J. A. Larsen's "Forest Types of the Northern Rocky Mountains and Their Climatic Controls" which appeared in the October, 1930/31 ^{number of} Ecology. The material for this article was gathered by Larsen while he was at the Northern Rocky

Mountain Station and originally intended for publication as a government bulletin. One of the important features of the report is a map showing the geographic distribution of the five main forest types of Region 1. This map is based chiefly on silvical reports and type maps in the Regional and Supervisor's offices, supplemented and correlated where necessary by Larsen's knowledge of the subject gained by 14 years of experience and extensive travel in the region. Larsen gives a very interesting discussion of the principal features of each forest type, its geographic and altitudinal distribution and its climatic requirements particularly with regard to temperature and precipitation. Such information is, of course, of considerable value as a guide to proper forest practices and as a foundation for further silvical research.

Weidman spent three days at the Priest River Branch Station in mid-April to go over with Thompson plans and work in progress dealing with arboretum planting, slash disposal, fire break construction and a number of improvement projects being carried out with emergency unemployment funds. Gradual progress is being made in the work of establishing our 200-acre area dedicated to arboretum planting and to experimental and demonstration plantations. A topographic map with five-foot contour interval has been completed as has also a classification of the area into dry, medium, moist and wet sites. A soil map has also been completed for about half the area. A little planting has already been done and four arboretum blocks of about an acre each are to be put in this spring. Planting stock for the project has been in the process of being raised for several years at Savenac Nursery.

Strong winds, low humidity and high temperature in late April caused rapid spread of a fire on debris covered land just outside the south boundary of the Experimental Forest. Quick action controlled this blaze before it reached ten acres. At this particular point there are several hundred acres both inside and outside the boundary which are covered with dead and down debris resulting from a forest fire in 1922 and which constitute an especially bad fire threat for us.

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PACIFIC NORTHWEST FOREST EXPERIMENT STATION

General

Growing

On April 24 the Office of Products, which as mentioned in last month's report has been merged with this Station, was moved into three rooms in the Lewis Building.

Educational Exhibit at Garden Club Show

"Good forest practice" and "poor forest practice" were illustrated in miniature in an exhibit put on by the Station at the Annual Garden Club Show at Laurelhurst Park. The good practice area showed in miniature cut-over land with scattered seed trees, thrifty timber edges, and seedlings coming in among the stumps, while the poor practice area represented a typical heavily burned tract with the green timber edges and seed trees destroyed and no reproduction coming in among the blackened stumps. A smoldering fire in the burned area gave the display a realistic touch. The exhibit was awarded the Club's gold ribbon of honorable mention. The installation was executed largely by McArdle, Isaac, and Kolbe.

Experimental Forests and Natural Areas

Material progress has been made on selection of an experimental forest and natural areas. Two natural area reports have been completed and are ready to send to the Forester, one for the Quinalt Natural Area, Olympic National Forest, and one for the Metolius Natural Area on the Deschutes. The Quinalt Natural Area, representing the Sitka spruce type, is admirably suited for the purpose; it is centrally located in the region, fits into general plan of management, and has large compact bodies of the primary Sitka spruce type and also of the secondary hemlock and cedar types that occur intermittently with the Sitka spruce. The Metolius area is a tract of typical western yellow pine with a little admixture of other species.

Isaac and Kolbe examined the Pringle Falls proposed Experimental Forest in the central part of the Deschutes National Forest. They found this area to be admirably suited for experimental purposes. It is centrally located in a large timbered region, of which it is a typical example, is very accessible by roads, has a drivable stream crossing through the center, and within two miles of a sawmill. Moreover the least accessible part of the tract is well suited for a natural area in that it contains similar conditions and timber as on the rest of the area.

Section of Forest Products

Mr. Gibbons returned to Portland April 27 after four months' detail in Washington, but only for two or three weeks.

Felling and Bucking in the Douglas Fir Region

Rapraeger has completed the greater portion of computations on the felling and bucking study. Felling and bucking in the region are done under a piece rate system largely, and it is interesting to note that

"Rests and Delay" items comprise only 12 per cent and 7 per cent of the working time in felling and bucking, respectively. Production studies by Bruce in California pine showed "Rest and Delay" items were 32 per cent of the total working time under a day wage system.

Minor Forest Products Study

Johnson spent the better portion of three weeks on this study in western Washington. It was learned that the American Smelting and Refining Company of Tacoma, Washington is using about 36,000 lineal feet of green Douglas fir poles each week in the smelting of copper ore. These poles are 25 to 28 feet long and 7 to 11 inches butt diameter. Reports would indicate that the green poles are placed in the molten ore to facilitate the separation of the copper from the slag.

There is produced annually in the state about 4,250,000 lineal feet of round and split Douglas fir mine timbers. Of this about 2,500,000 lineal feet consist of round, peeled timbers, commonly called Jap piling, for shipment to Mexico. These latter timbers have a minimum top diameter of 4 inches and a maximum butt diameter of 10 inches. They are cut in 18, 20, 22, and 24-foot lengths. Mine timbers used locally vary from 6 to 12 inches in top diameter and 6 to 14 feet in length, depending upon their use. At the present time the bulk of this material is cut from farm woodlots.

1930 Census of Lumber, Lath, and Shingles

Johnson devoted considerable time both in the field and office on this project. During the month 445 schedules were edited. Field work on this project consisted in rounding up delinquent companies, and also securing additional information where incomplete schedules were submitted.

Form letters were sent to all companies in Oregon and Washington who had not replied to former requests for census data, numbering about 200 in each state. Registered letters were sent to about thirty companies in each state.

Forest Survey of Douglas Fir Region

During April practically all of the survey organization, with the exception of some of the men working on national forests, has been busy on the strip survey of Lewis County. Four crews of three men each are now at work and in order to complete the strip survey by June 1 a fifth crew composed of men from the national forests will be started during the first week in May. At the same time compilation of the data gathered on the strip survey has been started in the office.

Buell has completed the compilation method field work in Lewis County, Washington, and started office work on timber volumes and type areas in order to have data on the compilation method ready by early June for comparison with the results of the strip survey method.

Economics of Forestry

Selective Logging in Douglas Fir

During the first half of the month a field crew of eight men under Brandstrom conducted time and cost studies of caterpillar tractor logging on the operations of the Simpson Logging Company near Shelton, Washington. This represents the only full-fledged caterpillar operation in the Douglas fir region, employing a fleet of six tractors with Athey Trusses for yarding and a specially built steam jammer for loading.

Caterpillar tractor logging is, of course, of special interest in the present studies of selective logging in view of the possibilities it offers toward more intensive selection and less attendant waste or injury of submarginal trees and areas than can be secured under donkey logging.

In the case on hand the total area embraced in the caterpillar setting is approximately one hundred fifty acres out of which only a fraction was covered with timber of sawtimber size, scattered about in generally small groups. The remainder of the area is covered with densely stocked young age classes from one to forty years old. No practical damage was suffered in these areas through the removal of the sawtimber.

The study covers about 4400 logs ranging in size from 50 to 3200 board feet, with yarding distances ranging up to 5400 feet. Topography and ground conditions were favorable. In the near future this operation will be moved to another area, which offers an entirely different set of conditions in regard to size and density of timber, ground conditions and topography. A check study will then be made to ascertain such factors of variation as may enter under conditions that are more typical of the Douglas fir region.

The latter half of the month was spent on a similar study of "skidder" logging on the operations of the Chas. R. McCormick Lumber Company near Bremerton, Washington. This company handles its logs in lengths up to 100 feet. The study offers a good opportunity in determining the possibilities of overcoming the higher cost of logging small timber by taking it out in longer lengths.

Forest Insurance

During April the collection of the supplementary individual fire reports from the wardens of western Oregon and Washington was completed. Filled out reports have now been received covering all fires of fifty acres or more during the five year period just past in all the protection districts of the whole Douglas fir region. One thousand four hundred ninety fires are covered by this collection of supplementary data, which are now presented in a form that makes them particularly valuable to the insurance study.

The field work in Cowlitz County was completed in April, and the crew moved to Snohomish and Skagit Counties. Shepard spent a few days with them in the field. The work in Cowlitz County required an unusually long time for completion, because in that county every fire of 200 acres or over was mapped and cruised regardless of whether it was reported as doing damage to timber or reproduction or not. This was done for the purpose of getting a close check on the question of whether some fires reported as doing no damage did not in fact burn some reproduction that was not recognized as such.

The last week in April saw the climatic phase of the insurance study definitely launched with the temporary appointment of a man who will devote his whole time to the compilation of data in the Weather Bureau offices. This activity will require at least three months time. The result is expected to be the assembling of data in such form that climatic zones can be delineated and rated with respect to place hazard due to climatic conditions.

Mensuration

The preliminary report on the growth and yields of selectively cut stands of western yellow pine recently prepared by Meyer, and distributed as an issue of the "Forest Research Notes", is intended to answer some of the immediate questions on the rate of growth after selection cuttings. The report contains a series of three alinement growth charts with a detailed set of instructions. One chart reads for basal area increase, the second for cubic-foot volume growth, and the third for board-foot volume growth. Under this method of prediction, it is contemplated that knowledge be had of the site quality of the land, the heaviness of the reserve stand, the percentage of vigorous, dominant trees in the reserve stand, and an estimate of the mortality risk. Then with any chosen cutting cycle, the yield can be predicted for any set of conditions. Further study will undoubtedly unfold further refinements, especially as to the factors causing abnormally fast or slow growth. Even as the charts stand and as measured by the size of the standard error of predicted values, the accuracy of prediction

is considerably better than in most of the even-aged studies of fully stocked stands of which we have knowledge.

With the transferral of Meyer's attention to forest survey matters for the next several months, the western yellow pine study will have to be dropped temporarily until next fall, at which time an analysis will be made of the growth of the individual trees to supplement the knowledge of the trees in their aggregate, which have been studied up to the present time.

Fire Studies

"Hour Control" analyses for the Whitman, Wallowa, and for the east side of the Rainier forests were completed during the month. A good start was made in combining the analyses of the seven eastern Oregon forests and final checking is practically completed for all analyses. Three copies have been made and colored for each of the 319 charts thus far prepared in connection with analyses of single forests.

The compilation of climatological data, which is being made primarily for the insurance study, will be a useful tool in fire studies. This compilation will cover all factors significant in forest fire hazard for the fire season, April 1 to October 30, for all places having records during the period 1921 to 1930 in western Oregon and Washington.

Arrangements are now being made for establishment of a mobile weather forecasting unit similar to that operated in California. The Regional Office, Weather Bureau, and the Experiment Station are cooperating in the project. At this writing the matter appears to hinge upon securing the services of a weather forecaster.

Considerable progress was made during the month in compiling as an office report all the weather-fuel measurements which have ever been made at the Wind River Branch. These valuable observations will thus be available at all times and ready for combining with similar material from other locations.

Wind River Branch

With our small allotment of "unemployment" money, a thirty-foot fire line has been built along the south side of the Wind River arboretum, and the arboretum itself has been much improved by the removal of the vinemaple, willow, and hazel brush that threatened to choke out the planted stock. The power line was removed out of the arboretum and considerably shortened. The roofs on the laboratory and Director's house have been reshingled and the office has been refinished in plywood. All these improvement activities have necessitated Simson's making several trips to Wind River. As a result of the unprecedented spell of phenomenally

low humidity and high winds, one of the fires in the Wind River valley got out of hand and made a 6-mile run up the valley. For a time the Station buildings and a number of valuable plots were threatened, but fortunately they suffered no loss.

Wind River Arboretum

Kolbe completed the spring arboretum work which had been interrupted by 16 inches of snow late in March. This year 269 trees were planted in the arboretum, among them 11 lots of conifers that are being given a trial for the first time. Approximately 20 specimens of each species were set out and a small surplus held in the nursery during the period of establishment for replacements. Now that we have nearly reached the saturation point as far as conifers that will survive outdoors at Wind River are concerned, we find it more and more difficult to obtain seed of the rarer conifers to test here. Exchanges of seed with other stations will be appreciated if they will tell us what they have.

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SOUTHERN FOREST EXPERIMENT STATION

General

Mr. R. E. Marsh, of the Office of Forest Economics, Washington, spent about ten days during the early part of April in conference with Dr. Ziegler and others concerning the Financial Aspects of Private Forestry projects.

Mr. C. F. Evans spent several days in New Orleans in conferences with Mr. Eberly, Dr. Ziegler, and others. During these conferences, an attempt was made to arrive at an accurate estimate for the revision of the Capper Report for certain of the southern states.

Mr. F. X. Schumacher, of the Office of Forest Measurements, Washington, spent the last ten days of the month at this Station, assisting Mr. Lentz in formulating plans for the office analysis of the Hardwood Survey data. During this time, Mr. Schumacher spent seven days with the Hardwood Survey field parties in East and West Carroll Parishes.

Management

During the month, Wahlenberg spent three weeks on an analysis of the data recently collected in Arkansas. This analysis consists of a preliminary growth study of shortleaf pine on the Ouachita National Forest,

and a report upon the search for an experimental forest area on the Ouachita National Forest. In the search for a suitable experimental forest, Wahlenberg and others made a reconnaissance of ten possible areas and gave a detailed account of two of the more promising ones. However, no really satisfactory area has yet been found, and further work will be necessary in order to find an area that is entirely suitable for the concentration of the Station's sample plot work in the pine region.

Forestation

During the month, Wakeley completed his reexamination of twelve thousand five-year and six-year-old pines at Bogalusa. This included a check re-examination on trees of all species to test the accuracy of the work.

The branch office at Bogalusa has been moved to the recently-completed Federal Building. The new quarters embrace four rooms on the second floor, and a large basement store room.

Wakeley reports that seeds from hand-pollinated cones of Pinus palustris in which the pollen was obtained from Pinus caribaea are producing, in the New Orleans nursery, what appear to be hybrid seedlings.

Naval Stores

Seven streaks had been placed on all trees by the end of the month. The first dip was made on the Sampson tract and at Raiford. The "Interval of Chipping trees" have been worked regularly and the more frequently chipped ones have been dipped once or twice. Eight new trees, four slash and four longleaf in the nine-inch class, have been faced and are being worked in cooperation with Professor Black and Mr. Thronson of the University of Florida. They also want to have some Gilmer-McCall cups installed, but it was found that the caps that go on these cups have been rusted out and Mr. Thronson is trying to have some new ones made up. The installation of these cups will be delayed until caps are manufactured. Mr. J. A. Hall of the Forest Products Laboratory suggested that the face on the tree which has the gum gage on it be sprayed with cold water immediately after chipping in order to test the effect of showers on gum flow. This suggestion will be followed out.

Several visitors came down to see the French face work and Col. R. E. Benedict of Brunswick is starting up four groups under this system, some at Hopkins and some near Brunswick, Georgia. Conferences were held with Miss Gerry in regard to the Naval Stores Handbook and the writing up of the section assigned to this Station has been started. Dr. Cary reviewed the last revision of the Naval Stores bulletin manuscript and suggested some changes. He brought up the question as to whether methods

of chipping affect growth as was stated in the bulletin and which was contrary to the statement carried in Harper's manuscript on the Effect of Turpentine on Growth. Therefore, it was found necessary to work up the growth figures from the second series of tests, 1926 to 1930, inclusive, and this is well under way. The computations, in fact, have been completed but an examination of the fields records shows certain discrepancies and it is necessary to make some remeasurements of checks.

Erosion

During March, the Southern Station established several erosion control planting plots in the silt loam uplands region of Mississippi.

Six plots of about one acre each were selected to represent the varying types of eroded sites occurring in western Mississippi. Extremes of soil type, underlying geologic formation, and climate are included. The areas are located in Marshall, De Soto, Lafayette, Carroll, Franklin and Adams Counties.

One-year-old nursery stock of the following species was planted on each area:

1. Loblolly pine
2. Shortleaf pine
3. Slash pine
4. Black locust
5. Red River oak
6. Red oak

A few gum and sycamore seedlings were planted on the Adams and Franklin County areas. A total of approximately nine thousand seedlings was set out.

Three of the plots had received some preparation before planting, as the building of brush dams in the gullies and the plowing in of gully banks. The remaining areas were planted without preparation.

It is hoped that these plots will yield information concerning the survival and growth of the respective tree species on the eroded sites, and concerning the effectiveness of the species in controlling erosion in the uplands of western Mississippi.

Meginnis, who left New Orleans April 1 for a six weeks' detail at the California Forest Experiment Station, spent two days en route studying erosion problems at the Southwestern Forest Experiment Station at Tucson, Arizona. At Berkeley, he has spent most of his time with Sundling and Lowdermilk, familiarizing himself with the technique used in attacking

the erosion and water use problems of California.

Financial Aspects of Private Forestry

Dr. Ziegler spent a number of days at the first of the month discussing with Mr. Marsh and Mr. Demmon the economic studies that have been made in Appling County, Georgia and Washington County, Florida. During the remainder of the month, he divided his time between the revision of the Capper Report and revision of the manuscripts dealing with the economic study of Appling and Washington Counties.

Bond and Reynolds spent a portion of the month working up the data that they collected in Hempstead County, Arkansas, and combining and correlating this material with work done by cooperators in these same counties. In addition, Bond began preparing plans for a Financial Aspects study for Polk County, Texas, in cooperation with the Texas Forest Service and the Division of Farm and Ranch Economics of the Texas Agricultural Experiment Station. As one phase of this plan, he developed new forms for collecting field data, after collaborating with Lentz in an attempt to correlate the information obtained upon the Hardwood Survey with the information to be secured from the Financial Aspects study.

Hardwood Survey

The Survey crew finished up Strip 1 on April 2 when they reached the Boeuf River. This strip was run by a six-man party and was the first trial strip. Following its completion, two three-man crews were organized and the subsequent strips with minor exceptions were run by three-man parties.

As a result of the first preliminary strip, many minor changes and several really important ones were made in the working plan procedure.

Lentz and Lehrbas obtained aerial photographs for the eight remaining strips for East and West Carroll Parishes of Louisiana. Photostatic copies of the War Department quadrangle sheets were also obtained. With the use of these maps and the aerial photographs, the starting points and other control points along the strip lines can readily be picked up. It has not been possible to recognize any fine type distinctions for the wooded areas from the pictures, but it is possible to pick out brush and dried patches. Second-growth or old field stands can be distinguished from the virgin timber and cut-over areas can also be recognized. The photographs can best be used in planning the day's work, picking up roads that can be traveled, and in being able to ascertain in advance when large areas of agricultural land will be encountered. The maps, even without the woods overlay, are almost indispensable, for they

are the only accurate base maps we have been able to obtain. The Engineers at the War Department headquarters at Vicksburg have been most helpful in their hearty cooperation!

A strip about four miles long was run on Pittman Island, Mississippi. This island lies on the west or Louisiana side of the Mississippi River, but is part of the State of Mississippi. The old "ox-bow", formerly the main channel of the River, is now silted up and supports a heavy stand of willow. In the 90's, steamboats made regular stops at points along the levee and during the 1912 high water, steamboats followed the old river course. During the 1927 high water, the island was submerged and the water was from ten to thirty feet deep in places. A fine stand of second-growth gum and also a virgin gum stand were found on the higher portion of the island where a sandy soil underlies the heavier clay. Much of the soil is a fine sandy loam and was at one time cultivated.

Where extensive areas of agricultural land are encountered, as along some of the high frontal lands, it has speeded up the strip running to have one man act as chauffeur, and, while the other two men cross the open land he can drive the car to a point where the strip line intersects the road.

Cut-over lands where fires have burned usually come up to black-berry briars, buck vine, poison ivy and other vines to form such a dense cover that it is extremely difficult to get through. Such areas greatly impede the crew's progress and are most disagreeable to work in. A mile and a half of strip in such going is a real day's work, and leather gloves combined with double-thickness canvass breeches and Filson coats are almost essential. Scratches on the hands, knees and face are a mute evidence of the bucking and slashing required to get through such areas. An infected briar or thorn scratch laid Lentz up for over a week. The easiest going in wooded areas is in the virgin timber, of which there seems to be very little left.

The "bolos" suggested by Ted Coile have proven to be an indispensable weapon and tool. They are used in place of a hatchet for blazing, driving tacks, cutting stakes to mark the plots, and are of such fine steel that five weeks of hard use have not dulled their edges. A collapsible "air rubber" boat has also proven its worth in crossing broad stretches of deep water. The boat weighs about twenty-five pounds and will easily carry three men. When not inflated, it fits into a canvass bag.

Mr. D. E. Lauderburn, Extension Forester, came over from Jackson, Mississippi to help the men in interpreting the aerial photographs. He feels that unless complete mosaics are obtainable and unless the hardwood types are made much more general, it would be impossible to get much help from photographs taken at an elevation of fifteen thousand feet. It was impossible, for instance, to distinguish a mixed pine-hardwood stand from a stand of pure hardwoods.

Mr. E. B. Deeter, of the Bureau of Chemistry and Soils, accompanied the field party on April 29 and 30th and made some very valuable suggestions concerning the soil and drainage classifications.

Ecology

During the month, Pessin established intensive experiments at McNeill, Mississippi on the plot that has been protected from fire and grazing for nearly eight years. These experiments are designed to give information concerning the competition of roots of longleaf pine seedlings with those of grass and advanced reproduction of pine. It is also planned to ascertain the cause for the slow rate with which the pines begin height growth. An experiment was established at McNeill to determine the effect of fire on the rate of height growth of longleaf pine seedlings and small poles.

Forest Pathology

Spraying of seedling longleaf in plots located near Bogalusa, Louisiana, was carried on during the month to maintain control of the brown-spot needle blight.

An examination was made of a series of plots in the same locality where commercial fertilizers had been added to backward seedlings to determine whether they would respond to soil treatment. It is thought that, by increasing plant vigor, the pine seedlings would overcome the brown-spot needle disease. The following materials are being used: (1) ammoniated raw bone, phosphate and potash, (2) Chilean sodium nitrate, (3) ammonium sulphate, (4) hydrated lime, and (5) a combination of numbers two and four. The experiment was started on February 19, 1931. The examination indicated that ammoniated raw bone, phosphate and potash has already stimulated this season's needle development among the pines and at the same time is forcing the growth of the ground cover. The remaining fertilizers do not as yet indicate any stimulatory influence on plant development.

Products Pathology

Four preliminary small scale dipping tests with promising non-mercurial compounds for sap-stain prevention were initiated at mills located in Texas and Mississippi. The present objective is to find an efficient stain preventive which is both free from the objection of possible injuriousness to workmen and consumers and preferably available for public service patents.

Stimulated by the results obtained in last season's commercial scale tests, over thirty-five pine and hardwood mills throughout the South

have already adopted one of the most promising materials for commercial trial. Representatives of the large borax manufacturers arrived in the South to study the potential field of borax for stain control at hardwood mills, and it is expected that this compound will come into some use as a result. Considerable enthusiasm relative to the possibilities of an effective stain preventive for use at small mills has been shown by small mill operators. The small mill presents a problem somewhat different from that of the larger mills, since the use of secondary power equipment is very limited or entirely lacking, thus precluding the use of regulation dipping equipment and hot solutions. Efforts are being directed at finding treatments and developing schemes of hand dipping which will meet the requirements of such small operators. A large scale dipping test on shortleaf pine and sap gum established at Fordyce, Arkansas in December and dismantled in April indicated that stain development during the winter months is sufficient to demand the use of stain prevention treatments.

A series of log tests established in November and examined in April indicated that insect damage at this time of the year, which is the normal banking season, may be of minor significance and that efficient control of stain and decay may be accomplished at a low cost by merely spraying the ends and exposed places on the sides of the log with any one of several treatments tested.

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RESEARCH ACTIVITY IN REGION 2

All of the technical force of the Experiment Station spent the first half of the month in the Colorado Springs office. Smith and Pletcher continued with the task begun during the latter part of March of transcribing the field data for sample plots within the Fremont Experimental Forest (M-1) in permanent record form, at the same time compiling stand and growth statistics for these plots. By the middle of the month the records for six plots had been completed.

Roeser completed the progress report write-up of the cutting methods study in the spruce-fir type on the Holy Cross Forest. This study is being conducted on five plots, three of which were established in 1911, with the other two of more recent origin. Following this, some time was spent in working over a considerable number of abstracts of German technical papers and some reviews intended for publication.

Two trips were made to the Fremont Field Station to keep in touch with seed tests of miscellaneous commercial lots intended largely for spring sowing at the Bessey (Nebraska) Nursery. The western yellow pine

seed (Black Hills, 1929), which was expected to provide the bulk of the seed for this year's sowing, exhibited a surprisingly low degree of viability by germinating only about four per cent, making it necessary to substitute the 1930 seed crop from the Harney. Fortunately, this seed is showing up much more satisfactory in the green-house tests.

On April 18, Fletcher and Smith moved up to the field station on Mt. Manitou. Although handicapped considerably by bad weather which prevailed toward the end of the month, they succeeded in completing the mapping and measuring necessary to place four management unit plots in Block A of the experimental forest in satisfactory shape. Considerable work of this nature remains to be done to bring the project up to scratch. It is expected that Smith will accomplish much of this during May. Fletcher left the Experiment Station on May 1 after a profitable winter's assignment to take charge again of the Absaroka District on the Washakie Forest.

The long contemplated trip to study the erosion situation in the South Park-Buffalo Peaks country on the Pike Forest and to outline a plan of action for a control experiment was finally made on April 23-24. The party included Supervisor Keithley and Ranger Leadbeater of the Pike Forest staff, L. H. Douglas of the Regional Office of Grazing, and Roeser of the Experiment Station. The Salt Creek drainage basin, which discharges into the Antero Reservoir, was decided upon as offering the most suitable area for the purpose of the study. Gulley erosion has been particularly severe in this drainage unit, due to a combination of causes; grazing, logging, fire, excessive rodent activity, floods. As a result, the protective vegetative cover, especially the sod of native grasses, has been badly depleted and much of the heavy, deep, easily erodible soil has been and is being washed away whenever one of the frequent heavy rain storms, which are characteristic of this particular locality, sweeps over the region. In addition to the large amount of detrital material which is deposited upon the fertile ranch lands in the outwash plain of the stream, its silt-carrying capacity is at times taxed to the limit. Since Salt Creek contributes to the water supply of the City of Denver, the problem of controlling erosion within its basin, and other basins within the same region, is an important one.

Decision was reached to establish six plots, three of which are to be immediately enclosed, upon which are to be studied various control measures, aiming principally to preserve and build up the natural ground cover. A working plan is now being formulated.

Prior to the close of the month, the growth data, based upon the most recent measurements in the sapling lodgepole pine thinning study plots, laid out in 1911, on the Washakie Forest, were summarized and a report prepared. One plot was thinned from below, a second from above, approximately 1,300 and 1,200 trees per acre, respectively, being left, while the third was left in its unthinned virgin state. Net periodic diameter increases for the 18-year period have been as follows:

	Unthinned Control Plot	Thinned From Below	Thinned From Above
First period, 1912-'16, incl.	.286	.528	.471
Second period, 1917-'23, incl.	.263	.384	.364
Third period, 1923-'29, incl.	.220	.311	.309

While the thinning from below has had only a slightly more favorable effect in stimulating diameter growth than the thinning from above, chiefly because no very poor trees were left to hold down the average, it resulted in a slight increase in volume increment over that of the control plot, which was appreciably in excess of that procured under the other form of thinning. The practical desirability of the latter method, therefore, is open to question. The gradual and steady decline in diameter accretion indicates, however, that a "leave" of 1,200 trees in a three-inch sapling stand 50 years old is too dense to procure the maximum-sustained rate of diameter growth necessary to reduce the rotation sufficiently to make the practice of forestry practicable.

On the 30th of the month, the first observations in the Douglas fir flower and cone production study were made at Fremont. A heavy crop of flowers and cones is in prospect. The first flowers to emerge about April 20 at the lower elevations (approximately 7,000 feet) were largely destroyed by frosts and the percentage of "set" will probably be low because of the uniformly wet weather which has prevailed during the period of pollen ripening and dissemination.

Supervisor Pearce, who spent most of the winter compiling and coordinating the results of the Regional strip survey Engelmann spruce growth study by increment borings, closed his work for the year with the opening of the field season. Not all of the Forests participating in the study succeeded in completing their final reports as requested, with the result that the work will probably be placed on the calendar for completion next winter.

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PACIFIC NORTHWEST

The Effect of Relative Humidity on Short-period Fluctuations in Fuel Moisture Content. A. G. Simson.

Preliminary Growth Alinement Charts for Selectively Cut Stands of Western Yellow Pine. By Walter H. Meyer.

APPALACHIAN

Birds of Western North Carolina. (Address at Vance High School) By T. D. Burleigh.

The Biltmore Forest School. Josephine Laxton (Submitted to American Forests).

The Establishment of the Pisgah National Forest, by Josephine Laxton (For American Forests).

LAKE STATES

Light and Plant Growth in a Virgin Norway Pine Forest, by Hardy L. Shirley (For J.A.R.)

The Influence of Light and Temperature Upon the Utilization of Organic Reserves in the Seed by Young Seedlings, by Hardy L. Shirley (For Am. Jour. of Botany).

NORTHERN ROCKY MOUNTAIN

Growth and Yield of Western White Pine. By I. T. Haig (For the Timberman).

IN PRINT

Abell, C. A. and
Hursh, C. R.,

Positive Gas and Water Pressure in Oaks.
(Science, April 24, 1931).

Buell, J. H.

Unemployed Cut Fuelwood on Pisgah National Forest.
(Forest Worker, March 1931).

Hansen, T. S.

Some Results of Thinning 27-year-old Jack Pine.
(Jour. For. April, 1931).

- Hill, C. L. The Development of Forest Research in California.
(Jour. For. April, 1931).
- Laxton, Josephine Pioneers in Forestry at Biltmore (American Forests,
May, 1931).
- Mitchell, J. A. and Forest Fires in Michigan. (Pub. by Mich. Dept. of
H. R. Sayre Conservation).
- Shirley, Hardy L. Does Light Burning Stimulate Aspen suckers? (Jour.
For. April, 1931).
- Shivery, G. B. Observations on Danish and German Forestry. (Jour.
For. April, 1931).
- Sinclair, J. D. Studies of Soil Erosion in Mississippi. (Jour. For.
April, 1931).
- Westveld, M. Girdling to Release Merchantable Sized Spruce and
Fir. (Pulpwood, Feb. 1931).

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OFFICE OF FOREST PRODUCTS

Census

The editing and preliminary tabulation of all schedules on hand at the beginning of the month was completed and about 100 additional reports received in April were prepared for transmittal to the Bureau of the Census. Over 400 complete returns were forwarded to Washington in two consignments mailed to the Forester on April 21 and April 30.

Although there are at least 50 names on the directory lists of the two states to be cleared up through additional requests by mail or personal interviews, all of the large mills in Montana and south Idaho have reported. Only two of the north Idaho mills rated Class 4 and upward have failed to send in their returns.

As compared with 1929, production reports received from the mills cutting 5,000 M or over in 1930 indicate a decrease in volume of the lumber cut amounting to 12.6 per cent for Idaho and 21.7 per cent for Montana.

The following comparison is based on the output of identical mills which contributed 84.3 per cent of the aggregate cut for these two states in 1929:

<u>State</u>	<u>No. of Mills</u>	<u>Lumber Cut (M feet board measure)</u>	
		<u>1929</u>	<u>1930</u>
Montana	13	341,011	266,853
Idaho	<u>24</u>	<u>853,771</u>	<u>745,911</u>
Total	37	1,194,782	1,012,764

The 37 mills included in this tabulation were operated by 29 different companies. The reports from 21 of these companies show decreased production during 1930. Eight establishments including 7 in Idaho and one in Montana produced more lumber than in 1929.

Lumber Manufacturing Costs in Inland Empire Sawmills

Philip Neff, Logging Engineer, and M. Bradner completed the annual cost collection trip during the first week in April. The Clearwater Timber Company mill at Lewiston, Idaho was the first mill visited when this work was started on March 16. Detailed lumber manufacturing and logging costs were obtained from 27 Inland Empire band mills located in eastern Washington, north Idaho and western Montana.

Manufacturing costs were generally higher in all classes of mills due to decreased production. All of the overhead expenses are increased rapidly per M with a lowering in the amount of lumber produced. Yarding charges as a rule are also higher, due to a much increased handling of the product.

In the larch-Douglas fir mills the cost per M of manufacture averaged 57¢ per M higher in 1930 than in 1929. In the Ponderosa pine mills the cost was \$1.18 per M higher in 1930 as compared with 1929. White pine mills costs were \$1.55 per M higher. The 27 mills visited in 1930 cut 1,001,625 M feet as compared with a cut in 1929 of 1,218,315 M feet by 28 mills.

At the request of the manager of the Anaconda Copper Mining Company's lumber department, Logging Engineer Neff and M. Bradner recomputed some of the western yellow pine tree data on the basis of 1931 values and costs. The Company is interested in finding out at what diameter limit to cut their stands in the western yellow pine type to secure enough round stull timber 12 inches and under in top diameter to meet the Butte mine requirements. They realize the great difference in cost of logging and milling the small trees as compared with the larger trees and are also aware of the difference in the value of the product. The problem of this company is somewhat different from that of the true commercial lumber company as the supplying of timbers for the mines is the foremost requirement.

Some work is also being done to study the cost of handling in the mines, of round mine timbers as compared with squared timbers. It is obvious that the company need not cut to as low a tree diameter limit if a majority of the round timbers used were replaced with sawed timbers. Mine timbers could be sawed from low grade, middle and top logs, thus increasing the mill run value of the remaining lumber produced. The office in co-operation with Logging Engineer Neff plans to work out preliminary figures for the company based on information already available. At the time of the conference with the Company manager, tentative plans were made for a much more detailed study of this problem. The Company is most willing to co-operate in a study of this sort. There is no doubt that areas demonstrating the correct manner of cutting this type of timber on a sustained yield management basis could be set up on company lands.

A study of this type with this company is of major importance in this Region. The Company is the largest operating owner of private stumpage in the State, and if their lands could be logged selectively, leaving a fair stand of green trees on the area a long step would be made forward toward private forestry in Montana.

Extensive Revision of Capper Report

Mr. Bradner was particularly busy during April on a revision of the stand and acreage figures for all agencies except the Forest Service in north Idaho and Montana. Tables on the drain from fire in the two States was also prepared by him. The R-4 staff at Ogden submitted the revised figures for south Idaho on acreage and stand. Assistant Regional Forester Koch prepared the stand and acreage figures for National Forest timber in north Idaho and Montana and the drain from insects and disease. The Northern Rocky Mountain Forest Experiment Station is handling the growth phases of the revision.

Lumber Prices and Movement

<u>Av. Mill-run Prices</u>	<u>Annual 1930</u>	<u>Annual 1931</u>	<u>January 1931</u>	<u>February 1931</u>	<u>March 1931</u>
Idaho White Pine	\$34.33	\$33.56	\$31.50	\$31.83	\$31.49
Western yellow pine	26.19	21.64	17.56	19.73	20.66
Larch-fir	20.29	17.32	14.50	13.34	14.81
White fir	20.94	16.34	13.87	13.86	13.50
Spruce	24.23	21.93	18.50	17.18	19.36

<u>Shipments and Cut</u>	<u>1930</u>	<u>1931</u>
Shipments	113,714	83,883
Cut	94,562	51,057

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DIVISION OF FOREST ECONOMICS

Stumpage and Log Prices

A statistical bulletin covering stumpage and log prices for the calendar year 1929 has been sent to the printer. This contains compilations of 4,344 sales of stumpage (about 16 billion feet) in 38 states, and 5,055 sales of logs (8-1/2 billion feet) in 35 states. Tabulations are arranged to show sales of both stumpage and log by species (hardwoods and softwoods), type of sale (individual and flatrate), States, and regions; the basis of the data by species; the amount sold in each State; the percentage of second-growth, virgin and mixed stumpage; and the percentage of veneer logs, lumber logs, etc., by species. There is also a brief comparison of stumpage, log, and lumber prices for the years 1928 and 1929.

Lumber Production

Lumber production questionnaires were received during April from the western Regions, but somewhat less in number than was expected. The Bureau of the Census had received enough eastern questionnaires to begin its annual estimate of the 1930 cut by comparison of identical mills. A call was therefore sent out to all Regions to supply as many questionnaires as possible, showing the cut of mills of Class 4 and upward. The response was prompt and gratifying.

Lumber Distribution

The number of distribution questionnaires received up to the end of April is larger than the number received in the comparable period of 1928. The number of usable returns is very satisfactory, resulting possibly from the use of a simpler questionnaire. It was also true perhaps that the mills have more time for preparing them during the present slump. Only one unsatisfactory card was returned to the West for further information. In the East between 50 and 60 letters were written to various firms, largely in the central and southern regions, asking for amplification of their statements. Practically all of the editing is up to date and the basic tables have been begun, starting with Region 6.

Extensive Revision

Work was begun by Reynolds on the assembly of material, for preparing the tables of commodity drain. The present plan proposes that there shall be not only a national drain table but 8 regional tables

corresponding to the regions in the Capper report. This presents considerable difficulties in arriving at regional totals in those cases where there is imperfect evidence of the regional source of the timber cut. The distribution of some of the items to regions will be greatly facilitated if the cooperating agencies can supply information which will give a check on the State production of hewed crossties, mine timbers, fence posts, poles, piling, and fuelwood. It is also hoped that the Census of 1929 will furnish information of value for this purpose in time for use. Information is needed showing by States the probable percentage of hewed ties in the total tie production. For fuelwood we need to know (a) the total consumption; (b) the quantity which is actual drain (i.e., green timber cut exclusively or principally for fire-wood); (c) the allowance of sawtimber per cord of drain; (d) the percentage of hardwood in the drain.

Land Utilization Study

Craig completed revision of his manuscript "Forestry in the Economic Life of Knott County, Kentucky," which presents the results of the study made last summer in cooperation with the Bureau of Agricultural Economics and the Kentucky Agricultural Experiment Station. The report is to be published by the University of Kentucky.

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FOREST TAXATION INQUIRY

The most important event of the past two months was the series of conferences participated in by the entire technical staff of the Inquiry, including Mr. Murphy from Washington and Dr. Wager from Chapel Hill, on the form and substance of the Inquiry's comprehensive report. A detailed outline for this report has been prepared and its preparation divided up among the members of the staff.

However, several members of the staff are still engaged in completing office reports and progress report manuscripts. Mr. Murphy is putting the finishing touches on his New Hampshire report, Mr. Wager and Mr. Thomson are engaged on their North Carolina report, and Mr. Pingree is working on the Oregon and Washington report.

Dr. Fairchild and Mr. Hall left for Europe the 11th of April, to be gone until the middle of June. They will complete the European phase of the tax study.

Mr. Hiley spent the month of March at the Inquiry office working on various special assignments in connection with the financial aspect of

private forestry study being conducted by the Forest Service.

Progress Report No. 12 entitled "The Assessment Ratios of Forest Property and Other Real Estate in Wisconsin" by R. C. Hall, was distributed to the mailing list, and reprints of Progress Report No. 4 dated April 15, 1929 entitled "Digest of State Forest Tax Laws" were received and have been distributed to those who were not able to secure a copy of the earlier issue of this report.

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